INTEGUMENTARY SYSTEM(SKIN)

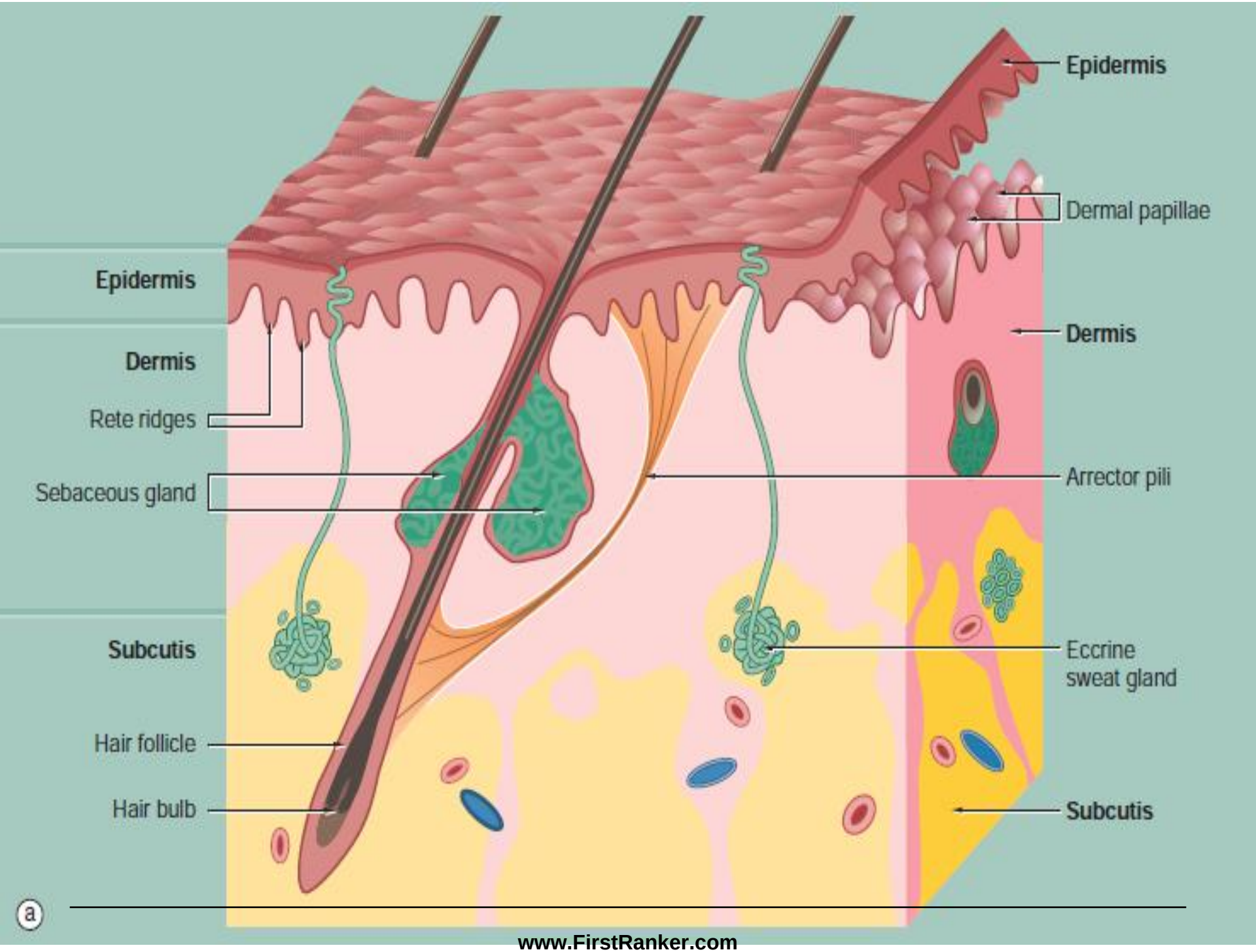
INTRODUCTION

- **Integumentary System**
- Skin and its derivatives (hair and nail).

Skin is outer covering of body.

Largest organ of body (16% of body weight).

- Consists of **epidermis** and **dermis**
- Epidermis is covered by ***keratinized stratified squamous epithelium***
- Dermis consists of ***irregular connective tissue***
- Beneath the dermis is ***hypodermis*** or a subcutaneous layer of connective tissue and adipose tissue that forms the superficial fascia.



FUNCTION OF SKIN

- Protection- from injury.
- It provides a barrier to water.
- Thermoregulation-- sweating
- Sensory perception- like pain, touch, temperature and pressure.
- Helps in production of vit.D.
- Excretions through sweat of water, sodium salts, and nitrogenous waste.

- ***TYPES OF SKIN—***
- **Thick skin**—Skin on the surface of palm and sole.
- Epidermis is thicker than elsewhere.
- Thick skin is hairless.
- **Thin skin**—present other places of body except palm and sole.
- Thin and hairy.
- ***MICROSCOPIC STRUCTURE OF SKIN—***
- Skin consist of two layers-
- **Epidermis**
- **Dermis**

- ***EPIDERMIS—***
- It consist of stratified squamous epithelium.
- ***Five layers in thick skin from deep to superficial***.

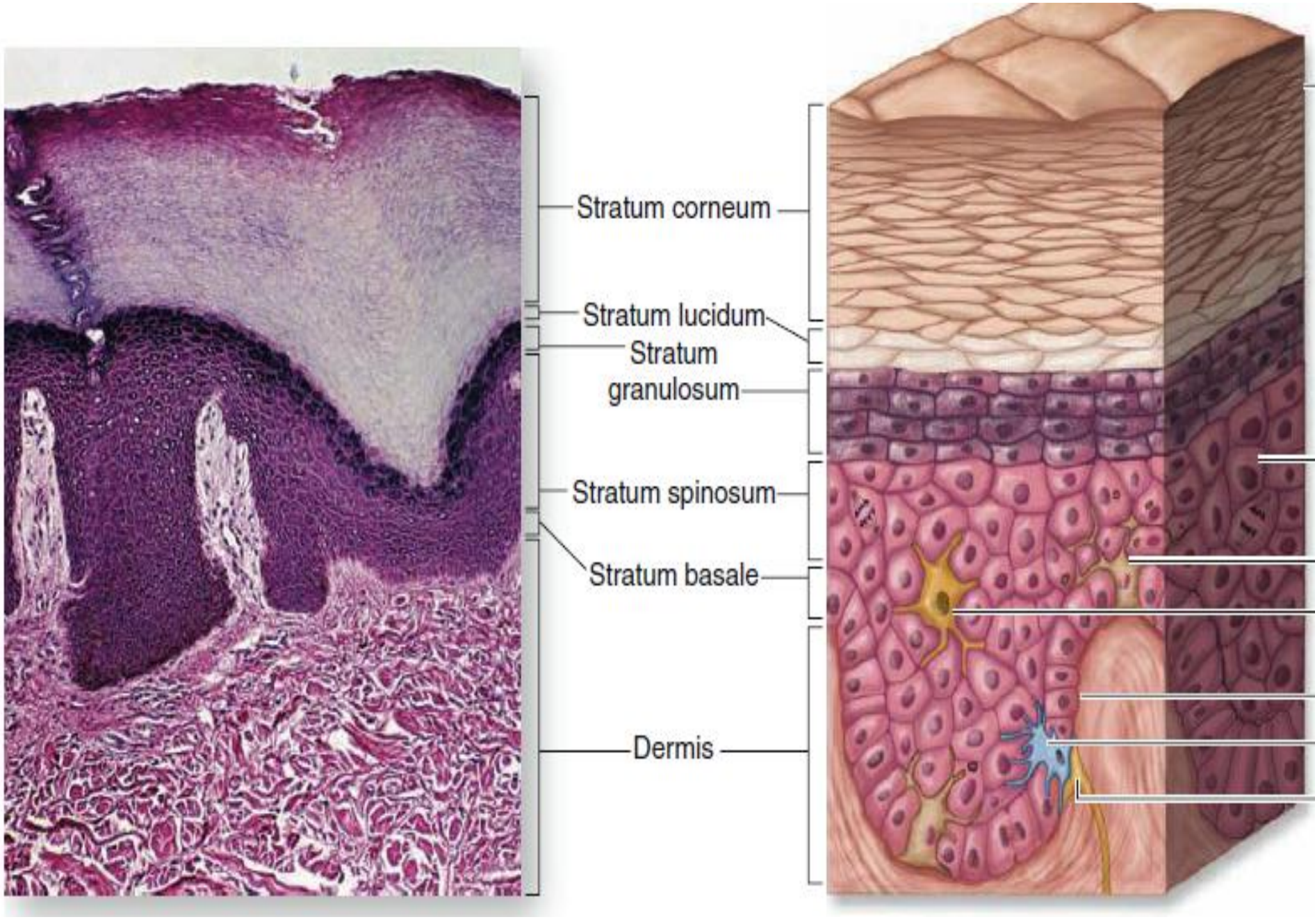
i)Stratum **basale**

ii)Stratum **spinosum**

iii)Stratum **granulosum**

iv)Stratum **lucidum**

v)Stratum **corneum**



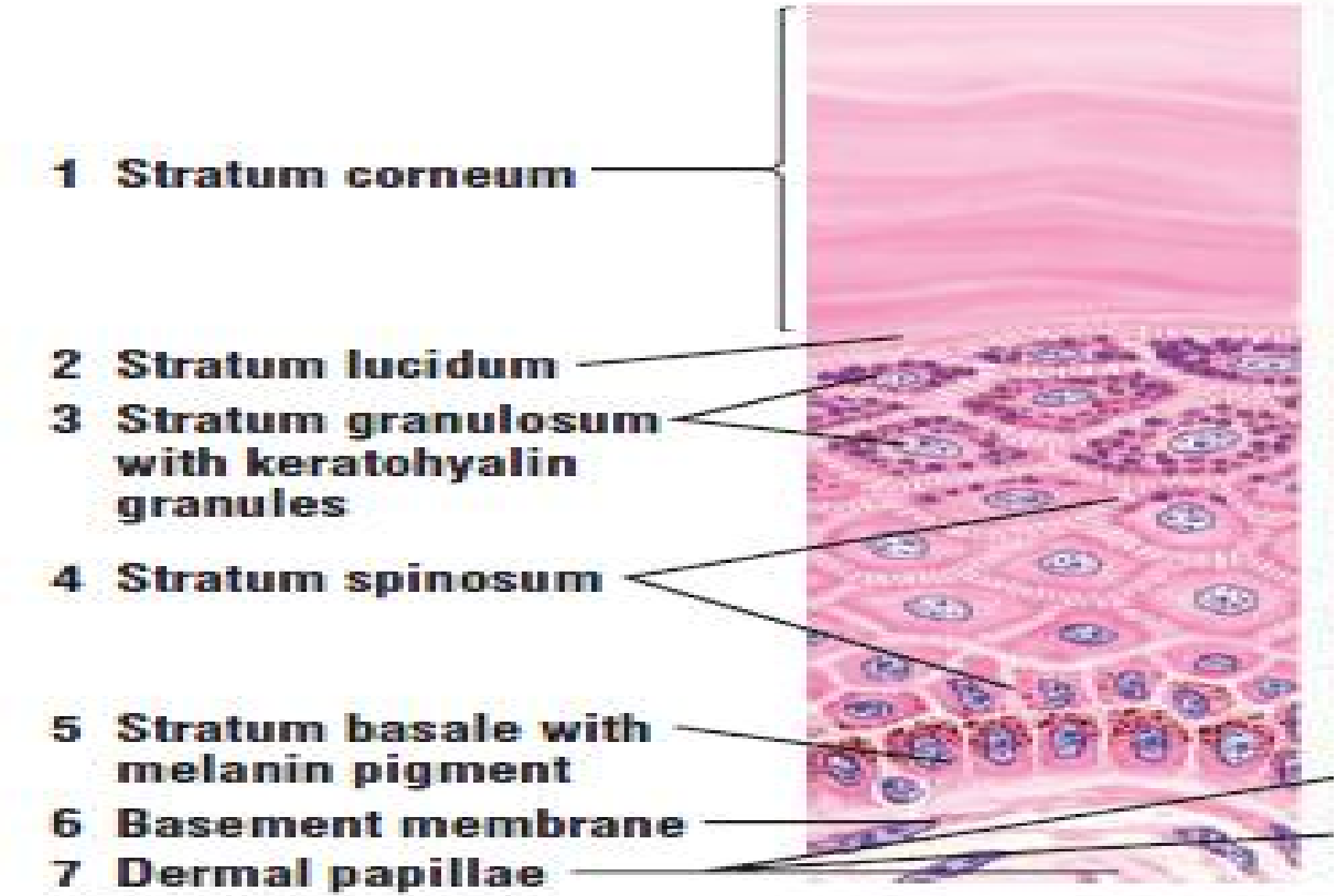
- ***Stratum Basale (Germinativum)—***

  - Deepest layer of epidermis

  -Single layer of cuboidal cells that rests on the basement membrane.

  - Cells attached by desmosomes and by hemidesmosomes to basement membrane.

  -The newly produced cells move towards superficial layer



- ***Stratum spinosum—***
- Consist of several layers of polygonal cells.

- During histological preparation, cells shrink and intercellular spaces appear as spines

- This layer well developed in friction and pressure area of skin.

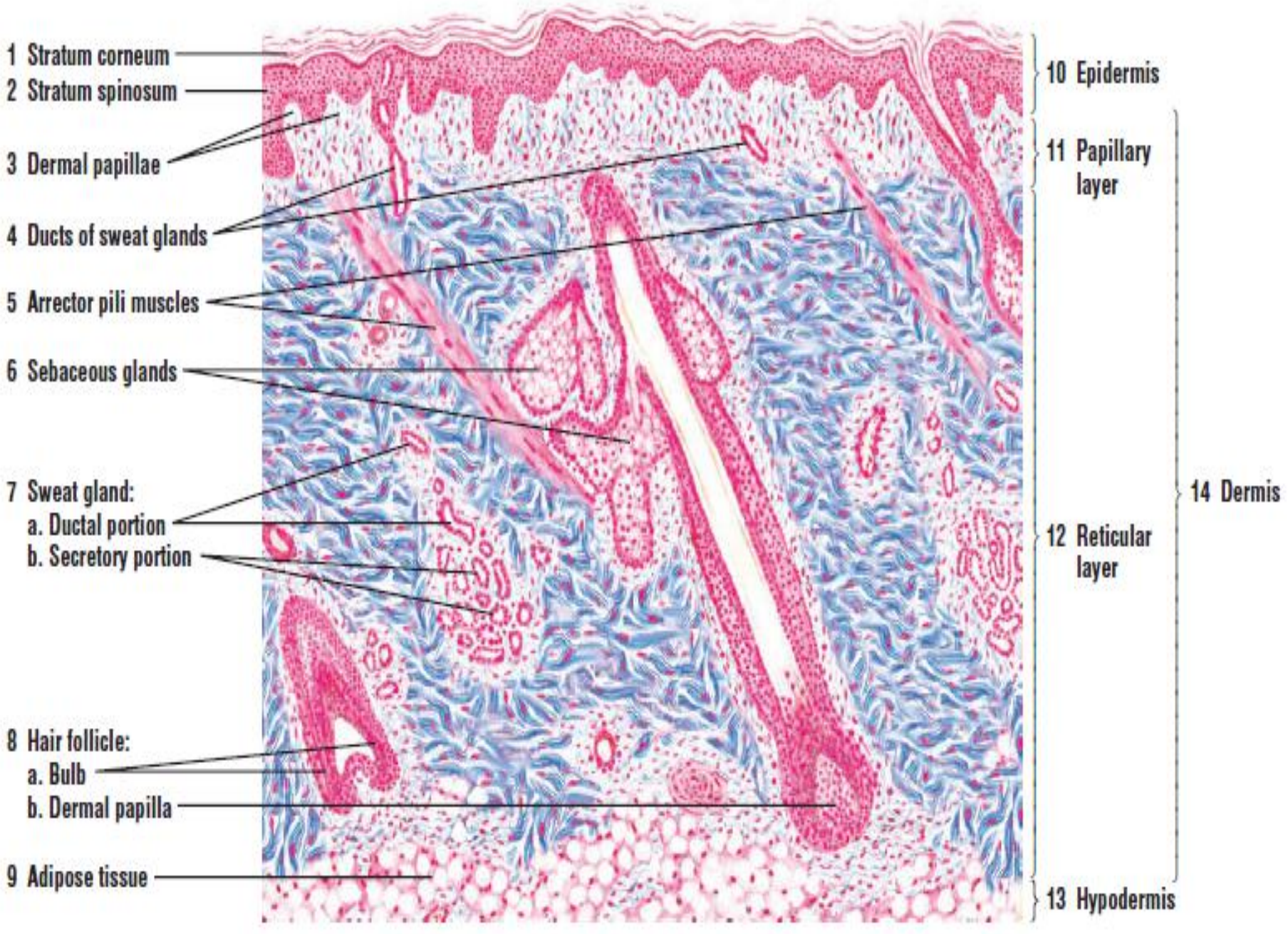
- ***Stratum granulosum—***
- Consists of 3-5 layers of flattened fusiform cells.
- These cells are filled with keratohyalin granules.

- ***Stratum lucidum—***
- Seen only in thick skin.
- Cells are flattened, translucent.
- These cells are filled with protein called keratin and eleidin.

- ***Stratum corneum—***
- Most superficial layer of epidermis.
- Composed of dehydrated dead cells.
- Cells are filled with keratin.
- Thickness is much more in thick skin.
- This layer is continuously sloughed off, this process takes 20-30 days.

- ***DERMIS—***
- Made up of collagen bundles.
- It also contains elastic fibres, nerves, lymphatics and blood vessels.

- It is divided into two layers.
- **Papillary layer**
- **Reticular layer**



- ***Papillary layer—***
- Narrow band of loose connective tissue in contact with basement membrane of st. basale.

- Shows finger-like processes (dermal papilla) projecting into under surface of epidermis.

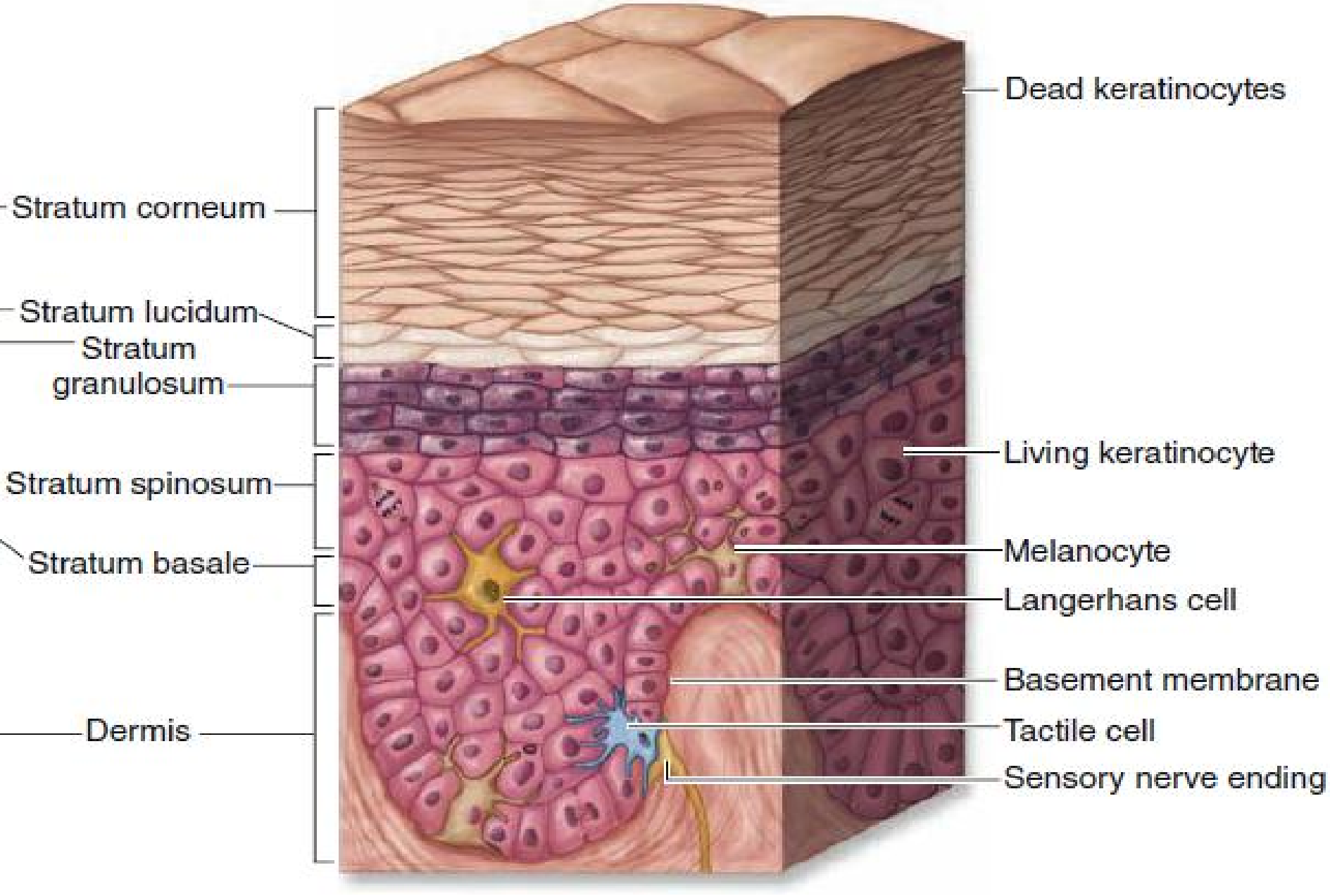
- Papilla contain *type III collagen*, elastic fibres, nerves, blood vessels and connective tissue cells.

- ***Reticular layer—***
- It contains bundles of *type I collagen*, thick elastic fibres, nerves, blood vessels and few connective tissue cells

CELLS OF EPIDERMIS

- ***Keratinocytes—***
- Most abundant cell (90%).
- Produces keratin
- Keratinocytes migrates from *stratum basale* towards surface.

- ***Melanocytes—***
- Derived from neural crest cells.
- Located between st. basale and st. Spinosum.
- Produce melanin pigments (responsible for skin colour).
- Melanin darkens skin colour and protect it from ultraviolet radiation.
- In white people melanin is degraded by lysosomes.
- In black people this pigment is more stable.



- ***Langerhans Cells—***

--Found in st. spinosum; part of immune system of body

--Are antigen-presenting cells of the skin.

- **Merkel's Cells—**

--Sensory cells present in the st. Basale .

--Derived from neural crest.

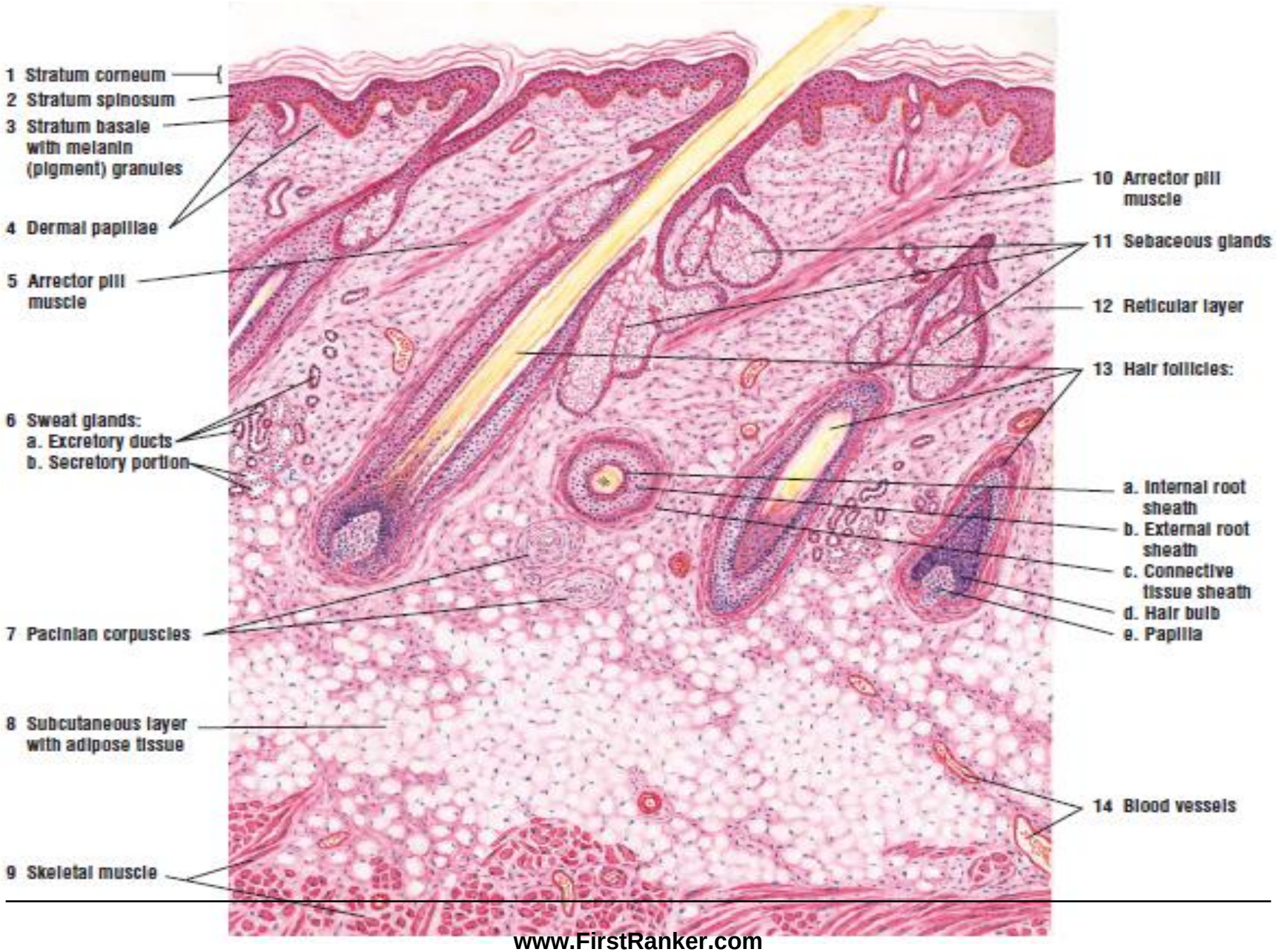
--Function as mechanoreceptors.

--Abundant in fingertips, oral mucosa and hair follicle

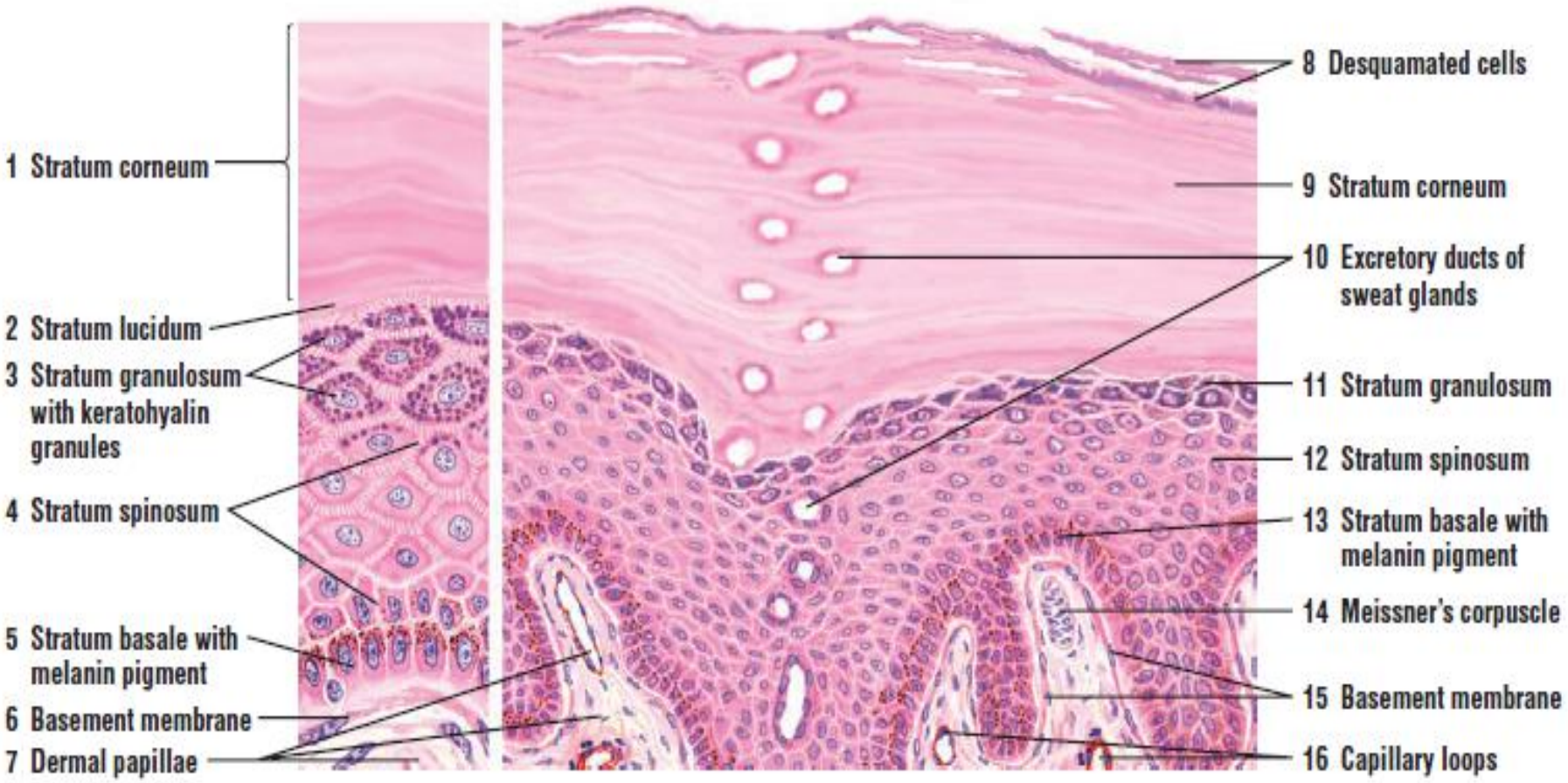
DIFFERENCE BETWEEN THIN AND THICK SKIN

	THIN SKIN	THICK SKIN
LAYERS OF EPIDERMIS	***ST. LUCIDUM ABSENT***	PRESENT
THICKNESS OF EPIDERMIS	0.10-0.15 mm	0.6-4.5 mm
HAIR FOLLICLES	PRESENT	***ABSENT***
SWEAT GLAND	FEW	MANY
SENSORY RECEPTOR	LESS	MORE
DISTRIBUTION	COVERS ALL THE PARTS OF THE BODY EXCEPT PALM AND SOLE	***PALM AND SOLE***

THIN SKIN

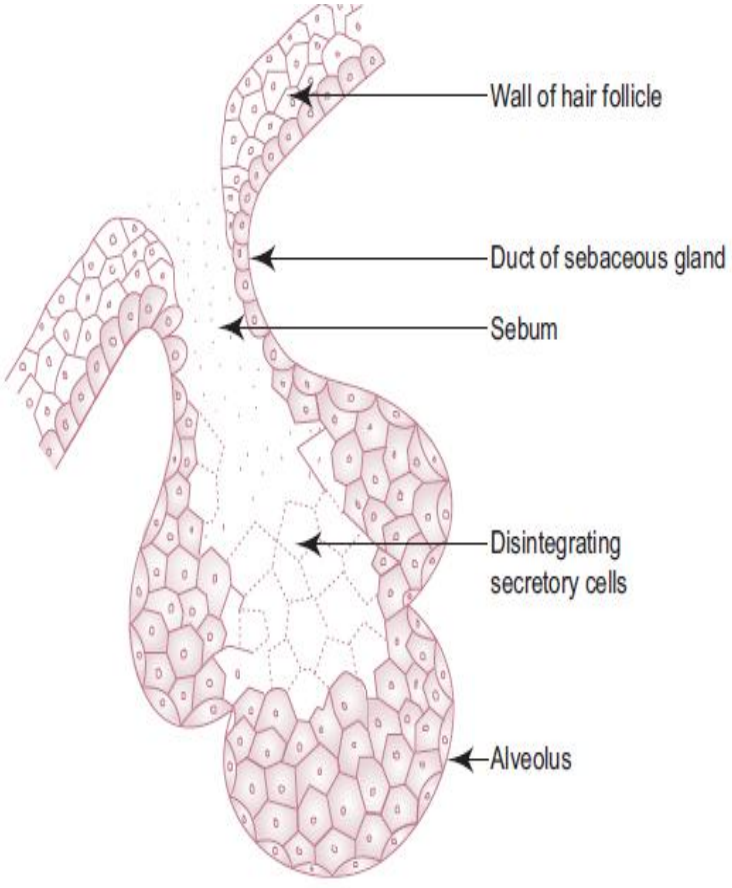


THICK SKIN



GLANDS OF SKIN

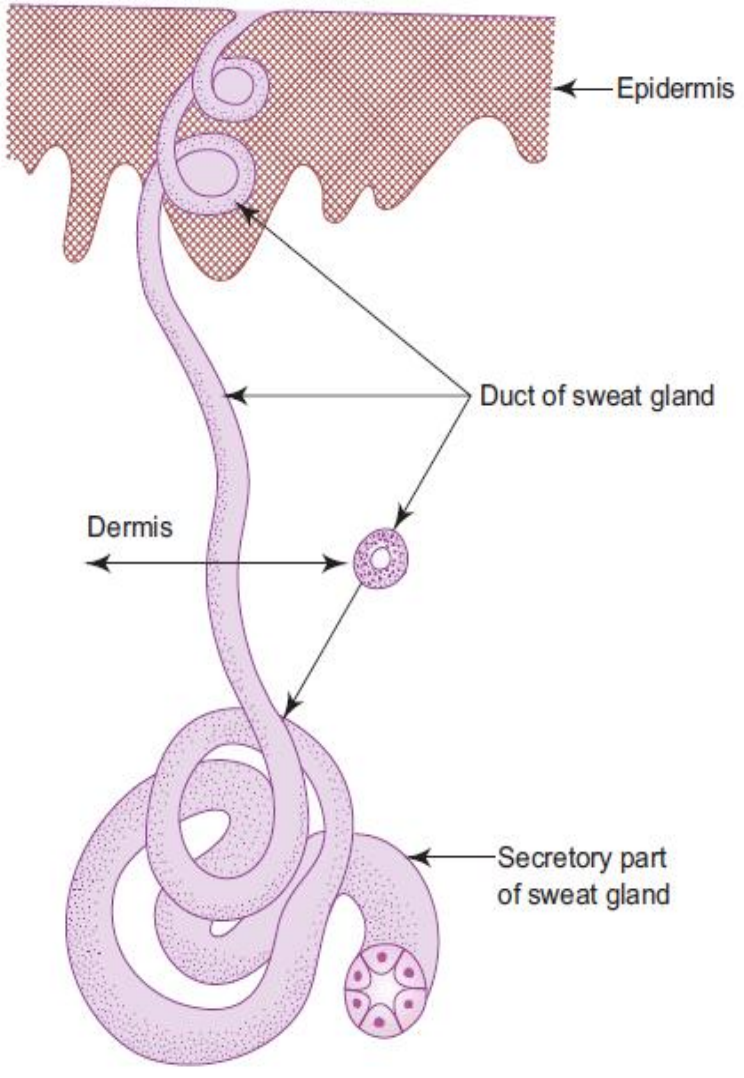
- **Sebaceous Gland**
- Present in the dermis of skin.
- Simple acinar gland whose duct opens into the hair follicle.
- It secretes oily substance called sebum.
- Sebum keeps the skin smooth to prevent it from drying
- Mode of secretion is holocrine.



- **Sweat Gland**
- Present in the deeper part of dermis and is widely distributed

- Simple coiled, tubular gland whose duct opens on the epidermal surface.

- watery secretion helps in maintaining body temperature



- **Two types of sweat glands→**

- **Eccrine:**

→ Widely distributed throughout skin.

→Densely in the palms and soles.

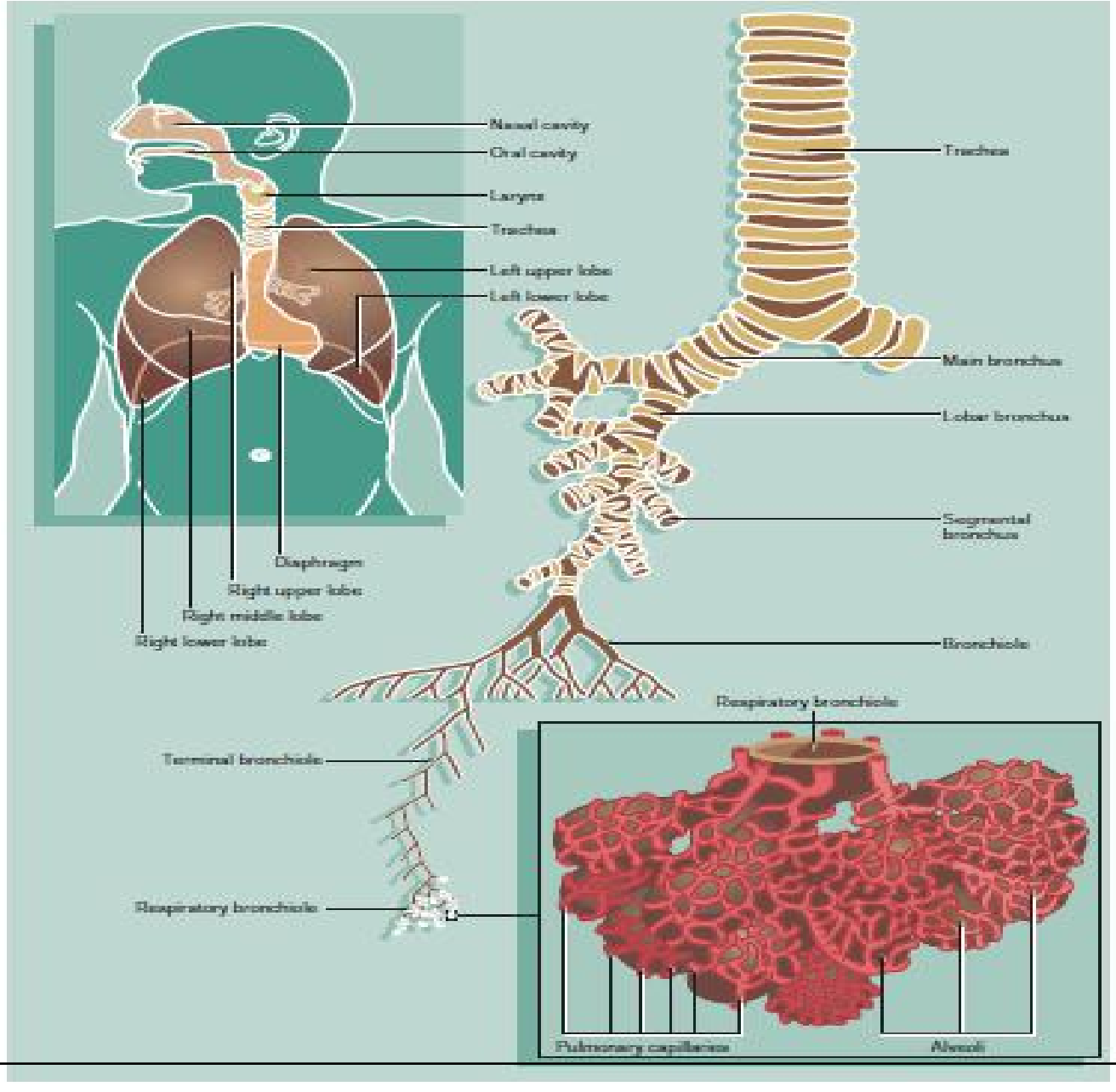
→Watery secretion.

- **Apocrine:**

→ Found in axilla, groin areola of breast.

→Thick viscous secretion

RESPIRATOTY SYSTEM



INTRODUCTION

- Consists of nose, pharynx, larynx, trachea and lungs.
- ***Functions:--***
- Perception of smell
- Filtration of inhaled air
- Phonation
- Respiration
- Maintenance of blood pH

- Functionally respiratory system consists of two parts.
- ***Conducting part—***
- Nasal cavity
- Pharynx
- Larynx
- Trachea
- Bronchi
- Bronchioles & terminal bronchioles.
- ***Respiratory part—***
- Respiratory bronchioles
- Alveolar duct
- Alveolar sac & alveoli.

Conducting part

- General structure of the conducting part
- Respiratory tract made of four coats—

1. ***Mucosa***—*epitehelial lining* and underlying *lamina propria*.

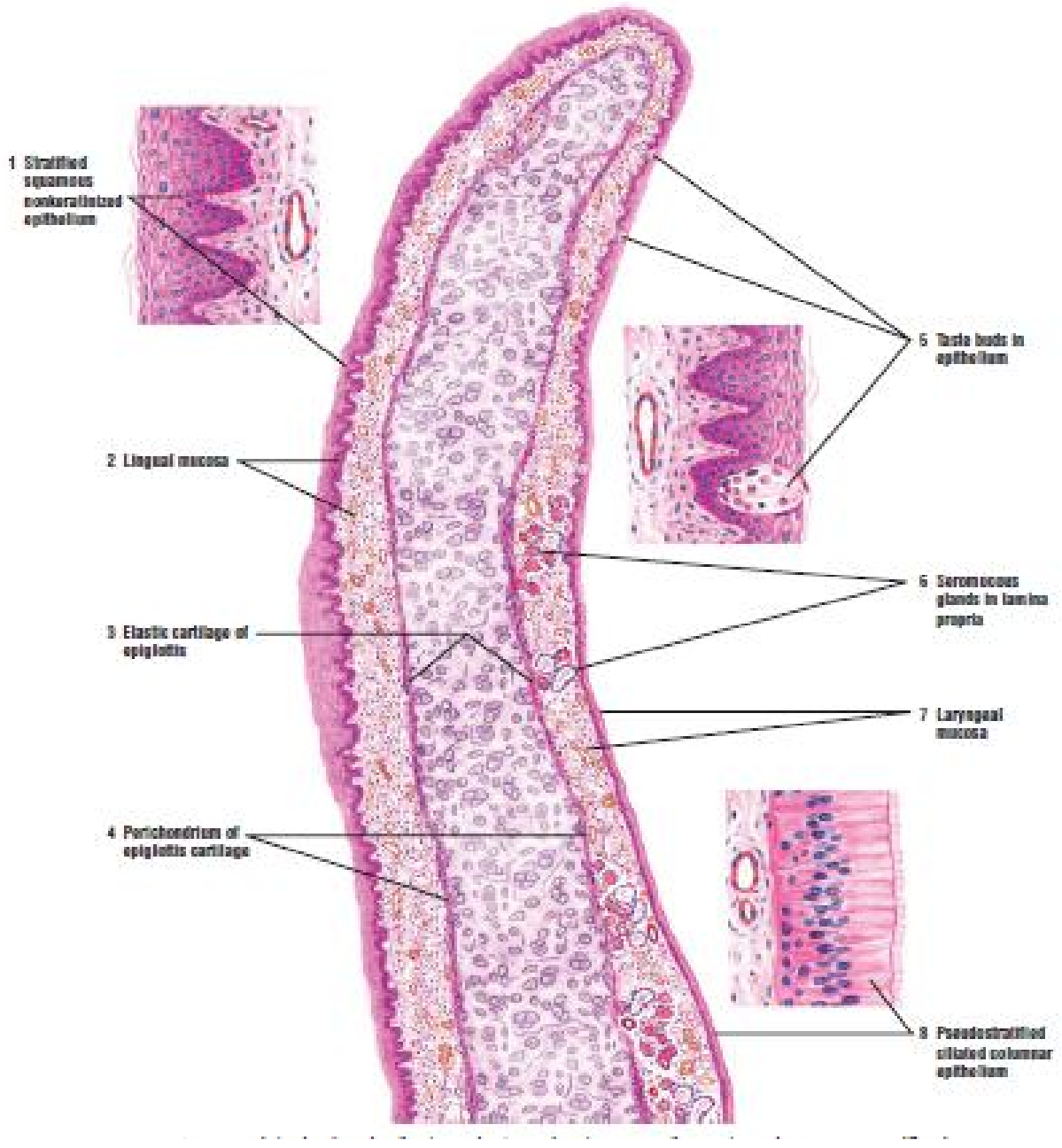
   Epithelium is usually *pseudostratified ciliated columnar* with goblet cells.

2. ***Submucosa***—layer of loose connective tissue containing mixed gland.

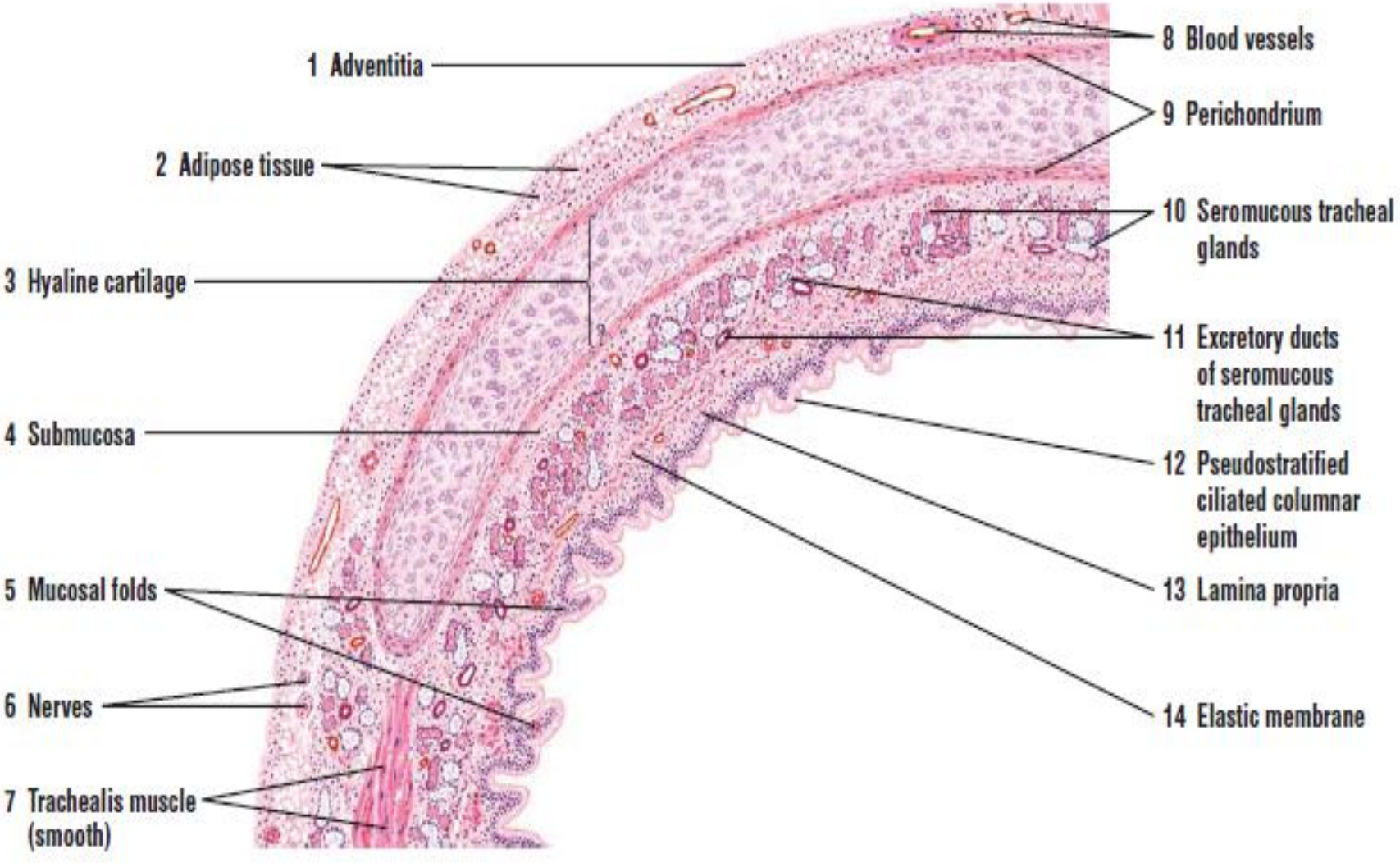
3. ***cartilage layer***—mostly *hyaline cartilage* and smooth muscle.

4. ***Adventitia***—fibroelastic connective tissue.

- ***Epiglottis—***
- Consists of a plate of **elastic cartilage**.
- On the both sides of cartilage there is presence of lamina propria.
- Lamina propria contains seromucous gland.
- Anterior surface & upper part of posterior surface lined by ***stratified squamous epithelium***.
- Posterior surface lined by ***pseudostratified ciliated columnar epithelium*** with goblet cells.

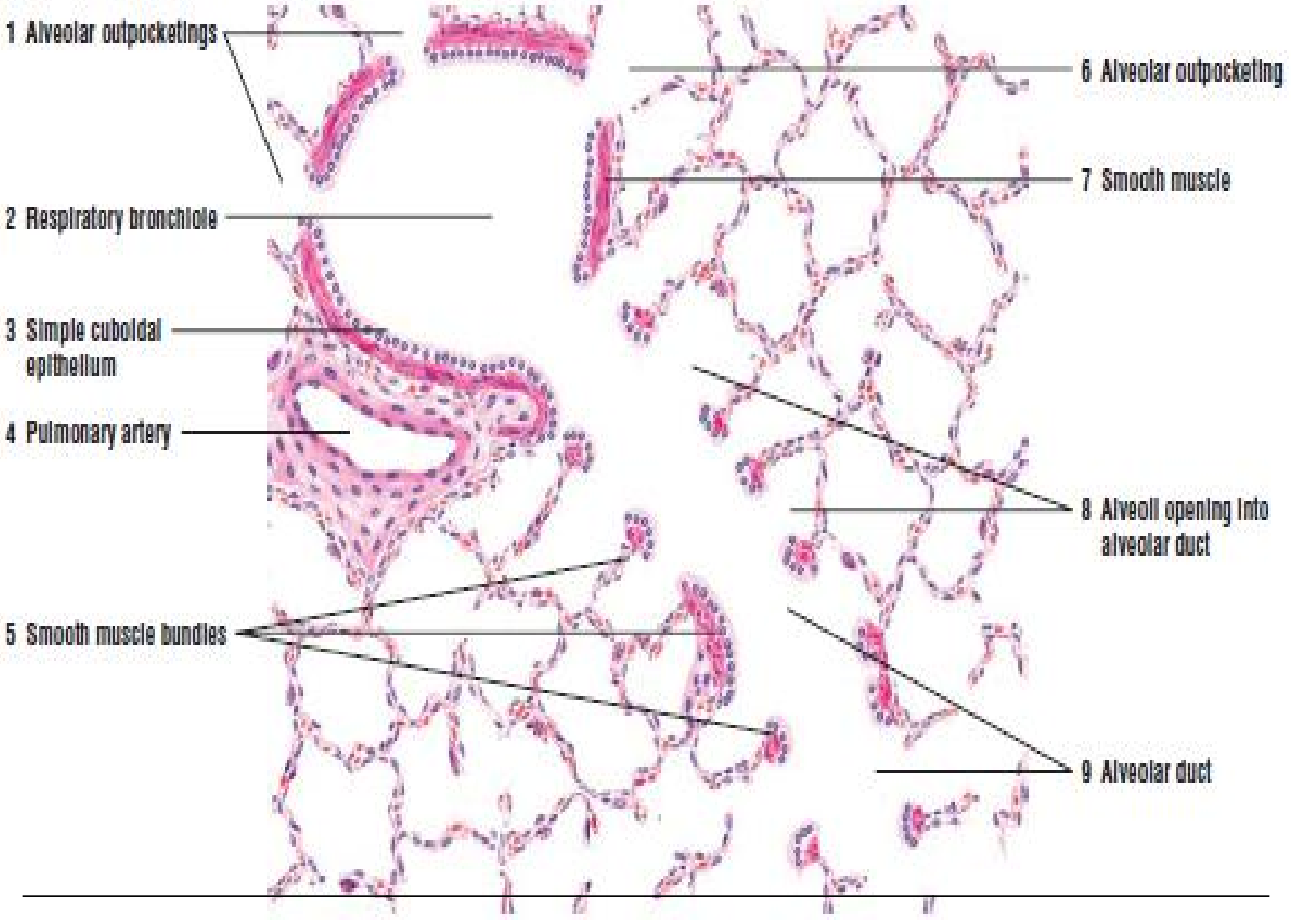


- ***Trachea—***
- The wall of the trachea consists of mucosa, submucosa, hyaline cartilage, and adventitia.
- Trachea is kept patent (open) by 16-20 C-shaped ***hyaline cartilage rings.***
- The gap between the posterior ends of the hyaline cartilage is filled by the smooth **trachealis muscle.**
- The lumen of the trachea is lined by ***pseudostratified ciliated columnar epithelium*** with goblet cells.

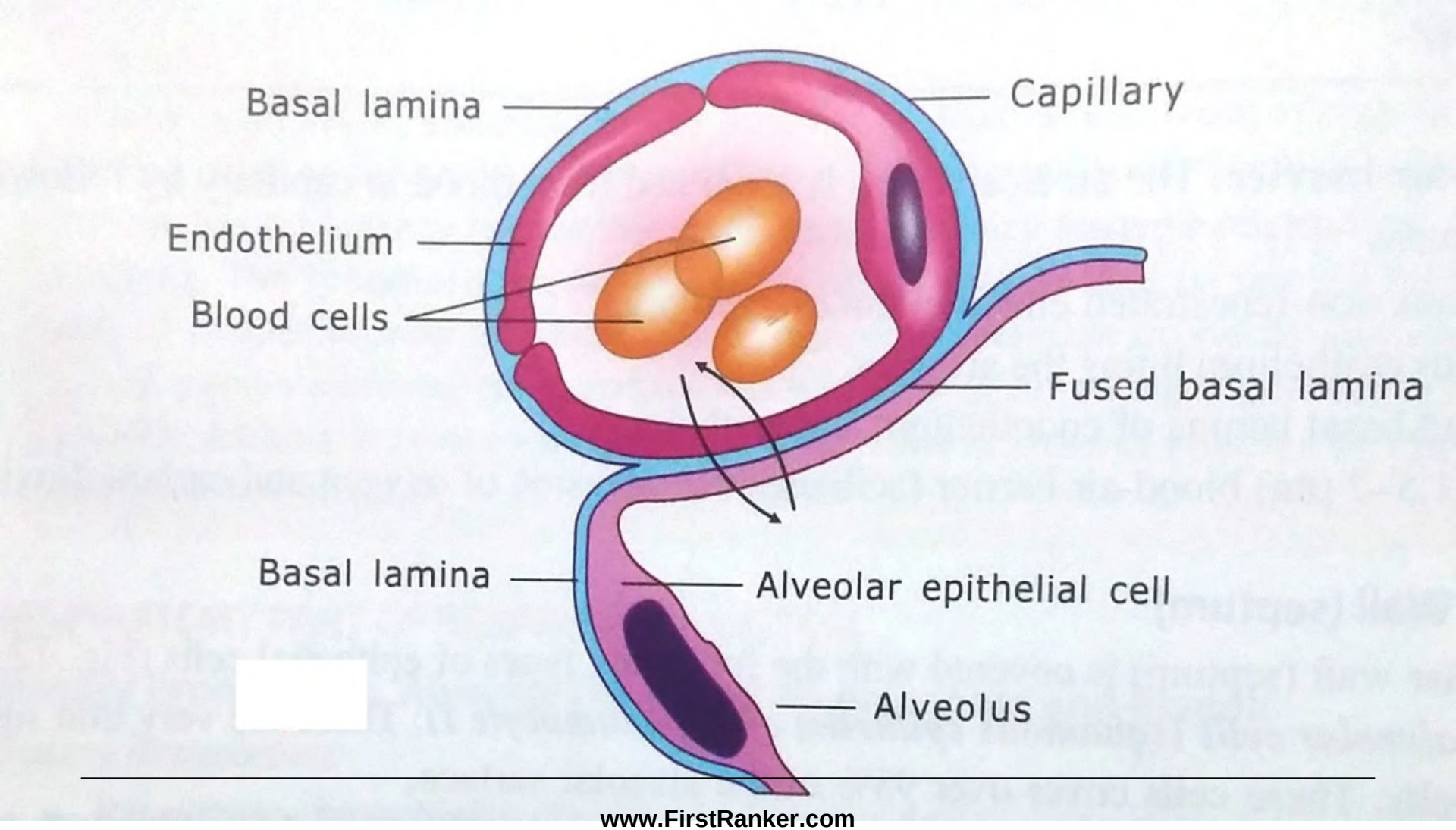


Respiratory part

- ***Respiratory bronchioles—***
- Transition from conducting part to respiratory part.
- Less than **0.5mm** diameter.
- Lining epithelium is ***simple cuboidal with cilia***.
- ***Alveoli—***
- Thin walled polyhedral sacs about **200 um** in diameter.
- Alveoli are closlely packed, so the alveolar wall is a partition or septum between two alveoli.
- ***Interalveolar septa*** contains network of capillaries.
- There may be opening in septa called as ***pores***.
- Lined by ***simple squamous epithelium.***



- ***Blood-air barrier—***
- The air in alveolus is separated from blood in capillary by three structures.
- *Endothelium of capillary*
- *Lining epithelium of alveolus*
- *Fused basal lamina of endothelium and epithelium.*
- This is thin (1.5-2 um) and facilitates the diffusion of oxygen and carbon dioxide.



- ***Cells of alveolar wall—***
- ***Type I alveolar cells (pneumocyte I)***
- Very thin squamous cells
- Cover 95% of alveolar surface
- ***Type II alveolar cells (pneumocyte II)***
- Large rounded cells contains microvilli
- Secretory in nature and secretes pulmonary surfactant, which lower surface tension and prevents alveoli from collapsing during expiration
- Type II alveolar cells also gives type I alveolar cells
- It also produces surfactant protein A, B, C and D

- ***Brush cells—***
- These cells found occasiniolly in alveolar epithelium.
- Serve as receptor to monitor the quality of air entering in lung.
- ***Alveolar macrophage—***
- Found in connective tissue of interalveolar septa
- First line defence against pulmonary infection.
- They phagocytes dust particles so called as ***dust cells***.
- In patients of heart failure the erythrocytes accumulate in alveoli which is phagocytosed by macrophage and acquire brick red colour so called as ***heart failure cells***.

Difference between Bronchus & Bronchiole

BRONCHUS	BRONCHIOLE
DIAMETER > 1 MM	DIAMETER< 1 MM
PSEUDOSTRATIFIED CILIATED COLUMNAR	SIMPLE COLUMNAR OR SIMPLE CUBOIDAL
SMOOTH MUSCLE	SMOOTH MUSCLE & ELASTIC FIBRES
CARTILAGE PRESENT	CARTILAGE ABSENT
GLANDS PRESENT	NO GLANDS